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As a preliminary matter, the undersigned thanks the Examiner for the courtesy of the telephone interview conducted on February 21, 2002. As stated during the interview, the undersigned believes all claims as amended and not withdrawn are allowable over the art of record.

Claim Rejections – 35 U.S.C. §103(a)

Claims 1, 4-16, 20 and 21 stand rejected under 35 U.S.C. §103(a) as purportedly unpatentable over U.S. Patent No. 5,895,929 to Abrokwah *et al.* The Examiner suggests that, with respect to claims 1, 4-13, 15, 16 and 20, Abrokwah ('929) discloses a HFET with a substrate 10 of GaAs, with AlGaAs intermediate layers, with layer 16 of GaAs, delta doped layer 22, InGaAs channel layer 23, AlGaAs layer 24 and GaAs cap layer 25. The Examiner further suggests that Abrokwah ('929) discloses a gate contact 30 having sidewalls 35 with the layer 25 partly removed. The Examiner still further proposes that while Abrokwah ('929) does not show layer 22 as comprising GaAs, it would have been obvious to form layer 22 with GaAs in order to demonstrate bandgap discontinuity with the channel layer. The Examiner further suggests that since layer 22 is delta doped, layer 22 would have some undoped material on either face. The Examiner also proposes that implantation in the Abrokwah ('929) disclosure is performed before layer 25 is removed. Applicants respectfully traverse these rejections.

In order to establish a *prima facie* case of obviousness under §103, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all of the claim limitations. (see MPEP, 2143). With respect to the first requirement as it relates *inter alia* to the rejection of independent claims 1 and 16, the pending Action fails to provide a reasoned basis for the suggestion or motivation to modify or combine the disclosure of Abrokwah ('929) with that of any other teaching. In rejecting claims 1 and 16, the Examiner has not cited any knowledge, teaching or reference for proposed combination with or modification of Abrokwah ('929). To the extent that such a combination has not been identified, under the second requirement, there can be no reasonable expectation of success. Moreover,

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even if the Abrokwah ('929) disclosure were combined with any other reference, knowledge or teaching of record, such a combination would not lead a person skilled in the art to develop Applicants' invention.

Notwithstanding the preceding argument, in order to clarify Applicants' invention and to further advance prosecution, Applicants' have requested entry of the instant amendment. Upon review of claims 1 and 16 as amended, it should be clear that Abrokwah does not teach each and every limitation of Applicants' invention. Indeed, as previously discussed, the disclosure of Abrokwah ('929) and the instant invention may be considered as very different technologies that produce very different products. For example, Applicants submit that Abrokwah ('929) does not teach removing a portion of a GaAs layer to expose a portion of the surface of a substrate where the remaining portion of the layer does not substantially extend beyond the horizontal profile of an overlying gate contact. Applicants therefore submit that independent claims 1 and 16 as amended are in condition for allowance.

Claim 4 recites a further limitation of claim 1 as amended wherein exposure of the second portion of the layer is employed to aid formation of the gate contact. Claim 5 recites a further limitation of claim 1 as amended wherein removal of the second portion of the layer is employed to aid in exposing a portion of the substrate. Claim 6 recites a further limitation of claim 1 wherein source and drain regions are implanted into the substrate after removal of the second portion of the layer. Claim 7 recites a further limitation of claim 1 wherein source and drain regions are implanted into the substrate before removal of the second portion of the layer. Claim 8 recites a further limitation of claim 1 wherein a spacer is formed after removal of the second portion of the layer. Claim 9 recites a further limitation of claim 1 wherein a spacer is formed before removal of the second portion of the layer. Claim 10 recites a further limitation of claim 9 wherein a third portion of the layer is retained underneath the spacer after removal of the second portion of the layer. Claim 11 recites a further limitation of claim 1 wherein the provided substrate comprises a delta-doped, heteroepitaxial semiconductor. Claim 12 recites a further limitation of claim 1 wherein the provided substrate further comprises a support layer, a buffer layer, a doping layer, a spacer layer, a channel layer and a barrier layer. Claim 13 recites a

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further limitation of claim 1 wherein the gate contact further comprises forming the gate contact on the layer. Claim 14 recites a further limitation of claim 1 wherein removal of the second portion of the layer further comprises retaining the first portion of the layer underneath the gate contact and removal of the second portion of the layer further comprises keeping the first portion of the layer undoped. Claim 20 recites a further limitation of claim 16 as amended wherein the delta-doped, heteroepitaxial semiconductor substrate further comprises a buffer layer, a doping layer, a spacer layer, a channel layer, a barrier layer, a capping layer, formation of the gate contact on the first portion of the capping layer, and removal of the second portion of the capping layer to expose a portion of the barrier layer.

Notwithstanding the recitation of novel elements in each of claims 4-13, 15 and 20, inasmuch as these claims variously depend from and incorporate all of the limitations of their corresponding independent claims 1 and 16 as amended, dependent claims 4-13, 15 and 20 are similarly allowable over Abrokwah ('929). Applicants therefore submit that claims 4-13, 15 and 20 are also in condition for allowance with entry of the instant amendment and respectfully request that the Examiner withdraw §103(a) rejection of the same.

Claim 14 recites a further limitation of claim 1 as amended wherein source and drain regions are implanted into the substrate which are annealed after removal of the second portion of the layer and which are provided with source and drain contacts after removal of the second portion of the layer. Claim 21 recites a further limitation of claim of claim 20 wherein the source and drain regions are annealed after removal of the second portion of the capping layer having a thickness of approximately six to nine nanometers.

Notwithstanding the recitation of novel elements in claims 14 and 21, inasmuch as these claims depend from and incorporate all of the limitations of independent claim 1 as amended and dependent claim 20 (which depends from independent claim 16 as amended), dependent claims 14 and 21 are similarly distinguished over the Abrokwah ('929) reference. Applicants therefore submit that claims 14 and 21 are also in condition for allowance and respectfully request the Examiner to withdraw §103(a) rejection of the same.

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Claim 2 recites a further limitation of claim 1 as amended wherein the layer has a thickness of approximately three to twelve nanometers. Claim 3 recites a further limitation of claim 1 wherein the layer has a thickness of approximately six to nine nanometers. Claim 19 recites a further limitation of claim 16 as amended wherein the capping layer further comprises a thickness of approximately six to nine nanometers.

Notwithstanding the recitation of novel elements in each of claims 2, 3 and 19, inasmuch as these claims variously depend from and incorporate all of the limitations of their corresponding independent claims 1 and 16 as amended, dependent claims 2, 3 and 19 are similarly allowable over Abrokwah ('929) in view of Examiner's reference Abrokwah *et al.* ('739). Applicants therefore submit that claims 2, 3 and 19 are also in condition for allowance and respectfully request that the Examiner withdraw §103(a) rejection of the same.

Claim 17 recites a further limitation of claim 16 as amended wherein formation of the source and drain regions further comprises implanting the source and drain regions into the substrate after removing the second portion of the capping layer and forming a multi-layered spacer after removing the second portion of the capping layer. Claim 18 recites a further limitation of claim 16 wherein formation of the source and drain regions further comprises implanting the source and drain regions into the substrate before removing the second portion of the capping layer and forming a multi-layered spacer before removing the second portion of the capping layer.

Notwithstanding the recitation of novel elements in claims 17 and 18, inasmuch as these claims depend from and incorporate all of the limitations of independent claim 16 as amended, dependent claims 17 and 18 are similarly allowable over Abrokwah *et al.* ('929) in view of Abrokwah *et al.* ('285). Applicants therefore submit that claims 17 and 18 are also in condition for allowance and respectfully request the Examiner to withdraw §103(a) rejection of the same.

CONCLUSION

The cited references have been reviewed and are not believed to affect the patentability of the instant invention. After entry of the instant amendment,

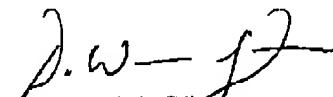
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claims 1-21 are pending in the application. Reconsideration and allowance of all claims 1-21 is earnestly requested.

No amendment made herein was related to the statutory requirements of patentability unless expressly stated; rather any amendment not so identified may be considered as directed *inter alia* to clarification of the structure and/or function of the invention and Applicants' best mode for practicing the same. Additionally, no amendment made herein was presented for the purpose of narrowing the scope of any claim, unless Applicant has argued that such amendment was made to distinguish over a particular reference or combination of references. Furthermore, no election to pursue a particular line of argument was made herein at the expense of precluding or otherwise impeding Applicants from raising alternative lines of argument later during prosecution. Applicants' failure to affirmatively raise specific arguments is not intended to be construed as an admission to any particular point raised by the Examiner. For example, Applicants' election not to present argument as to the Examiner's proposal that Abrokwah discloses a layer 25 having near equivalent thickness as compared to Applicants' invention is not intended to preclude Applicants from presenting further argument on this point at some point in the future.

Should the Examiner have any questions regarding this Response or feel that a telephone call to the undersigned would be helpful to further prosecution in this matter, the Examiner is invited to call the undersigned at the number given below.

Respectfully submitted,



Douglas W. Gilmore
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Dated: February 27, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

In accordance with 37 CFR § 1.121(c)(1)(ii), the following separate marked-up rewritten claim versions are provided for replacement of claims 1 and 16:

1. (amended) A method of manufacturing a semiconductor component comprising:

providing a substrate with a surface;

providing a layer comprised of undoped gallium arsenide over the surface of the substrate;

forming a gate contact over a first portion of the layer; and

removing a second portion of the layer to expose a portion of the surface of the substrate, wherein the remaining first portion of said layer does not substantially extend beyond the horizontal profile of said gate contact.

16. (Amended) A method of manufacturing a semiconductor component comprising:

providing a delta-doped, heteroepitaxial semiconductor substrate with a surface, the delta-doped, heteroepitaxial semiconductor substrate comprising:

a support layer comprised of semi-insulating gallium arsenide;

a buffer layer comprised of undoped gallium arsenide overlying the support layer;

a doping layer delta-doped with silicon and overlying the buffer layer;

a spacer layer comprised of undoped gallium arsenide and overlying the doping layer;

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a channel layer comprised of indium gallium arsenide and overlying the spacer layer; and

a barrier layer comprised of aluminum gallium arsenide and overlying the channel layer, the barrier layer forming the surface for the delta-doped, heteroepitaxial semiconductor substrate;

providing an undoped gallium arsenide capping layer having a thickness of approximately three to twelve nanometers and overlying the surface of the delta-doped, heteroepitaxial semiconductor substrate;

forming a gate contact over the undoped gallium arsenide capping layer, the gate contact covering a first portion of the undoped gallium arsenide capping layer and absent over a second portion of the undoped gallium arsenide capping layer;

removing the second portion of the undoped gallium arsenide capping layer after forming the gate contact to expose a portion of the surface of the delta-doped, heteroepitaxial semiconductor substrate, wherein the remaining first portion of said undoped gallium arsenide capping layer does not substantially extend beyond the horizontal profile of said gate contact;

forming a spacer adjacent to the gate contact;

forming source and drain regions in the delta-doped, heteroepitaxial semiconductor substrate; and

forming source and drain contacts over the source and drain regions after removing the second portion of the undoped gallium arsenide capping layer.